

[0013] FIG. 2 is a simplified illustration of a battery system according to some embodiments of the present invention;

[0014] FIG. 3 is an illustration of an exploded view of a battery system including a housing, rolled electrodes, and a connection module according to some embodiments of the present invention;

[0015] FIG. 4 is a cross-sectional, partial top view of a housing and module terminal that can be incorporated into the battery system of FIG. 3 according to some embodiments of the present invention;

[0016] FIGS. 5A and 5B are cross sections of a housing and rolled electrodes that can be incorporated into the battery system of FIG. 3 according to some embodiments of the present invention;

[0017] FIGS. 6A-6H are side views of simplified battery housings that can be incorporated into the battery system of FIG. 3 according to some embodiments of the present invention;

[0018] FIG. 7 is a simplified cross section of an electronic device that can be used with battery system of FIG. 3 according to some embodiments of the present invention.

[0019] FIGS. 8A and 8B are simplified cross sections of a portion of an electronic device illustrating the differences between the pouch battery of FIG. 1 and the battery system of FIG. 3 according to some embodiments of the present invention.

DETAILED DESCRIPTION

[0020] Lithium-polymer batteries are commonly used as rechargeable batteries to provide power to electronic devices. Some of these batteries can include rolled or stacked electrodes and electrolyte solution sealed in an aluminized laminated pouch. The seal can include a wide section of material that needs to be folded next to the pouch. The pouch can have a positive voltage that can cause corrosion in electronic components if the pouch contacts the electronic components. To accommodate the pouch sealing material and isolate the conductive surface of the pouch battery, the battery needs to be smaller than the designated battery area provided in the electronic device, resulting in wasted space and a shorter battery life for the electronic device.

[0021] Some embodiments of the invention provide a solution to this problem by having a battery with an electrode surrounded by a rigid or semi rigid housing that can be in close proximity to electronic components without interfering or damaging the electronic components. For example, in some embodiments the electrode is surrounded by a metal housing hermetically sealed around the electrode at a flange. The metal housing can be coupled between the ground terminal of the electrode and common ground. The flange reduces the amount of excess material that needs to be fit into the space designated for the battery and the grounded metal housing can contact the electronic components without damaging them. This allows the battery to be increased in size, reducing wasted space and allowing for the electronic device to have a longer battery life without increasing the size of the electronic device.

[0022] These and other embodiments are discussed below with references to FIGS. 1-7; however, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes only and should not be construed as limiting.

[0023] FIG. 1 is a simplified illustration of a previously known pouch battery 100. The pouch battery 100 includes a pouch 110 surrounding electrodes 120 (e.g., rolled electrodes) and electrolyte 122. The pouch 110 includes a seal section 112 around the perimeter that seals the electrodes 120 and the electrolyte 122 inside the pouch 110. The seal section 112 leaves excess pouch material that is folded or compressed. The pouch 110 can have a positive electric charge causing galvanic corrosion in electronic components that contact the pouch 110.

[0024] To avoid the pouch 110 contacting other components, an effective battery area 130, which represents the space inside an electronic device required for the battery to be incorporated into that device, is defined around the pouch battery 100. The effective battery area 130 includes the pouch battery 100 and the contact gap 132 needed to separate the pouch 110 from the other electronic components and allow the pouch 110 to expand in response to gases generated by the electrodes 120 reacting with the electrolyte 122. The contact gap 132 is empty space in the electronic device and limits the size of the pouch battery 100. Limiting the size of the pouch battery 100 also limits the amount of electrical energy that can be used by the electronic device.

[0025] FIG. 2 is a simplified illustration of a battery 200 according to some embodiments of the present invention. The battery 200 includes a housing 210 forming a cavity for receiving rolled electrodes 220 and electrolyte 222. In contrast to the pouch battery 100 shown in FIG. 1, the housing 210 of the battery 200 does not include a large sealing section with excess material similar to seal section 112. Instead, the housing 210 includes two or more components made of rigid or semi-rigid material and includes a flange 212 around a perimeter of the components to hermetically seal them together and form the housing 210. The housing 210 can be made from a metal or other electrically conductive material and connected to a ground terminal of the electrode, allowing the housing 210 to come into contact with electronic components without causing corrosion or other electrical damage. Since the battery 200 does not have a large sealing section with excess material and can contact components without causing damage, the size of the battery 200 can be increased while still being able to fit in the same designated battery area or the size of the designated battery area can be reduced to accommodate other components in the electronic device or to shrink the size of the electronic device. In some embodiments, the housing 210 can be used as a structural element in the electronic device. For example, the housing 210 can be used as an attachment point for a bracket or a component in the electronic device.

[0026] Electrolyte 222 can be added to the interior of housing 210 to react with the rolled electrodes 220. Electrolyte can include liquid with one or more salt compounds that have been dissolved in one or more solvents. The salt compounds can include lithium-containing salt compounds in embodiments, and can include one or more lithium salts including, for example, lithium compounds incorporating one or more halogen elements such as fluorine or chlorine, as well as other non-metal elements such as phosphorus, and semimetal elements including boron, for example. In some embodiments, the salts can include any lithium-containing material that may be soluble in organic solvents. The solvents included with the lithium-containing salt can be organic solvents, and can include one or more carbonates. For example, the solvents can include one or more carbon-